SYNOPSIS

TO STUDY THE STRUCTURAL ASPECTS, DEGRADATION, KINETICS AND BIOLOGICAL EFFECTS OF COPPER (II) MUSTARD SOAP AND COPPER (II)SOYA SOAP AND THEIR COMPLEXES

ताम्र(II)–सरसों व ताम्र(II)–सोया साबुनों तथा उनके संकुलों के संरचनात्मक आयामों, विघटन, गतिकीय तथा जैविकीय प्रभावो का अध्ययन

A
SYNOPSIS
SUBMITTED TO
M.D.S. UNIVERSITY AJMER
FOR DOCTOR OF PHILOSOPHY
(FACULTY OF SCIENCE)
(Chemistry)

SUPERVISOR
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S.P.C. GOVT. COLLEGE, AJMER

Submitted By
VANDANA SUKHADIA

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OUTLINE OF PROPOSED RESEARCH WORK

1. Name of scholar (in English) VANDANA SUKHADIA
2. Title of the Research (in English) TO STUDY THE STRUCTURAL ASPECTS ,DEGRADATION , KINETICS AND BIOLOGICAL EFFECTS OF COPPER (II) MUSTARD SOAP AND COPPER (II) SOYA SOAP AND THEIR COMPLEXES

   (in Hindi) ताम्र(II)–सरसों व ताम्र(II)–सोया साबुनों तथा उनके संकुलों के संरचनात्मक आयामों, विघटन, गतिकीय तथा जैविकीय प्रभावो का अध्ययन

3. Location :
   (A) Institution/ Department where the work is to be done — S.P.C. GOVT. COLLEGE, AJMER

   (B) Geographical area of Investigation — S.D. GOVT. COLLEGE, BEAWAR, M.D.S. UNIVERSITY AJMER, RAJASTHAN UNIVERSITY, JAIPUR, J.N.V. UNIVERSITY, JODHPUR
4. Introduction ,Importance of proposed investigation & objectives — Enclosure – 1
5. Review of work already done on the subject of proposed research study — Enclosure – 2
6. Research gaps identified in the proposed field of investigation — Enclosure – 3
7. Major hypothesis if any — Enclosure – 4
8. Research methodology — Enclosure – 5
9. Bibliography — Enclosure – 6

Signature of the Candidate
(Vandana Sukhadia)

Outline of the synopsis approved.

Name & Signature of the supervisor with date and seal.

12.12.17 13.12.17

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ENCLOSURE-1

INTRODUCTION AND IMPORTANCE OF PROPOSED INVESTIGATION & OBJECTIVES

Photo catalysis plays important role in our ecosystem. All the process run is found very close to our environment so it is also known as Advance Oxidation Process (AOP).

Photo catalytic degradation is found to be a very efficient process for mineralization of organic pollutant where semiconductor acts as photo catalyst [1] .Copper complexes have a wide diversity of uses in the electrical refrigeration & heavy industries in powder metallurgy. Some non edible oils are antibacterial, antiviral, antiseptic, and antiparasitic like Neem oil[2]

Copper complexes have multipurpose approaches in different fields like wood preservation, dyeing, detergency, electroplating, foaming, wetting, herbicidal - pesticidal activities, lubrication, paints, emulsification etc [3-13]. Nitrogen & Sulphur containing aromatic ligands are ubiquitous components both for physiologically active products & important pharmaceutical. The study of copper with these ligands is very important in bioinorganic chemistry, redox chemistry, material science & multi electron redox chemistry. [14]

Large molecule of copper (Pongemia) soap cannot be metabolized rapidly by micro organism naturally so photo catalysis degradation has been considered to be an efficient & rapid process for the degradation of copper soaps derived from edible and non edible oils.[15]

Spectroscopic studies like NMR, IR, C^{13} NMR, ESR and thermo gravimetric analysis are also very important. The magnetic moment studies suggest the diametric nature of complexes and confirm that complexation has taken place successfully & biodegradable soaps & complexes have been investigated. [16]

Some dyes, surfactants & other organic pollutants have been studied from time to time but many more areas are still untouched in photo degradation of metallic soaps & complexes of different indigenous oils with some ligands. [17-22]

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OBJECTIVES

Various edible oils like ground nut, sesame and non edible oils are used for many purposes in industries, pharmaceutical. They are eco friendly also.

Photo catalytic treatment has been proved to be most effective and economical method for the removal of contaminates found in textile elements. Degradation of pollutants from water & air has historically been and remained the most researched one. [39, 26]

The main objective of the proposed research work is as follows:

1. Synthesis of copper soaps derived from various sources like pure fatty acids, edible and non edible oils.
2. Purification of soap.
3. Synthesis of complexes.
4. Purification of complexes.
5. Spectroscopic studies IR, NMR, C ^{13}NMR, ESR etc. of soaps and complexes.
6. Photo catalytic degradation of copper soap derived from pure fatty acid & edible oils and their complexes with ligands.
7. To study the various parameters like pH, semiconductor, concentration of soap and complexes, on degradation.
8. Thermal degradation of copper soap & their complexes with various ligands.
9. Fungicidal activities & biological effects of metal-soap derivatives.

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ENCLOSURE-2

REVIEW OF WORK ALREADY DONE ON THE SUBJECT OF PROPOSED RESEARCH STUDY.

Research work in any area plays an important role in new investigation and development. Many branches are opened by current scientific researches like nano-science, green chemistry and spectroscopy, photochemistry etc.

Copper (II) soaps prepared from pure fatty acids and vegetable oil (Ground Nut, Mustard, Sesame, Soya bean) have also been analysed for their micelle characteristics. Various studies like spectroscopic, thermal, micelles, ultrasonic, dielectric etc. have been done on copper complexes and copper soaps. [23]

Study of photo catalytic degradation of Rhodium B dye using hydrothermally synthesizes Zinc has been done.[24] Use of Zinc Oxide particulate system as photo catalyst : Photo Bleaching of Toluidine blue has been studied [1]. Mixed ligand complexes of copper plays important role in numerous chemical and biological system like dyeing, antioxidant electroplating etc .[25] .Photo catalytic degradation of Malachite Green over Cadmium Sulphide coated Titanium has been studied. [26]

Study of degradation and Kinetics of copper (II) soap derived from Pongamia Pinnate (Karanj) in presence of irradiated semiconducting ZnO has been done [27].Photo catalytic decomposition of carboxyl derivatives in the presence of semiconductors & the light induced decomposition of saturated carboxylic acid an iron oxide incorporate clay suspended in aqueous solutions have been studied earlier. [28]

Photo catalytic degradation and structure of stearic acid by zero thin films ant nano structures deposited by different chemical routes has been done. [29] Photo catalyzed degradation of hazardous dye methyl orange by use of a composite catalyst of multiwall carbon nano tubes & titanium dioxide has been studied [30]. Photo catalytic oxidation of formic acid and the effect of additives on this reaction have been studied [31 ,32] . Photo catalytic decomposition of carboxylic acid derivatives in the presence of semiconductors and the light induced decomposition of saturated carboxylic acid on iron oxide incorporate clay suspended in aqueous solution have been studied earlier. Photocatalytic degradation of oxalic acid over TiO_2 powder was investigated in earlier research. [33,34]

The study of synthesis and characterisation of anti fungal agents containing Copper (II) soap and derived from Mustard and Soya bean oil has been done [35]

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Vegetables oils based lubricants are slowly replacing the mineral oils due to their extra ordinary bio-degradability and many other specific properties. The study of copper metal in Fungicidal activities for exploring their applications & possible uses in various industries and agriculture. (16)

Synthesis and characterization of copper metal soaps from the *Thevetia peruviana and Hura crepitans* seeds oil have been studied (46). Viscous behaviour and nuclear studies of some biodegradable organo metallic complexes in solvent system have been studied. Transition metal copper (II) is highly interesting due to their significance in physical and bio organic chemistry. (14)

Use of Zinc Oxide as photo catalyst for photo degradation of copper soap derived from *Azadireta Indica* (Neem Oil) has been studied.(36) Synthesis and biological evaluation of some Macro cyclic copper complexes has been done. Biological activities of some new environmentally safe 2- Amino Benzothiazole complexes of copper II derived under microwave irradiation have been studied. (35)

Thermo gravimetric analysis of copper(II)soap derived from Ground Nut and Sesame oil have been done .(27) Copper shows poisonous effect where its concentration upto 44 mg/ L specially if the water has a high pH value (Around 7.0) effect of pH and concentration on reactivity of copper has been studied earlier. (37) Fatty acids are used in the field of cosmetics, grease and varnish also. (38)

We have chosen the synthesis of copper soaps derived from fatty acids & their complexes and some natural oils to understand structural aspects and kinetics parameter through various studies. The scientific & technological implications of photo catalysis process are well recognized today.

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ENCLOSURE-3

RESEARCH GAPS IDENTIFIED IN THE PROPOSED FIELD OF INVESTIGATION

Reference on the related subject reveals the importance of the propose field. For this purpose literature survey from different universities and searching through internet had been done. It had been found that plenty of work needs to be done in the proposed field.

Photo catalytic degradation has been considered to be efficient process for the degradation of organic pollutants, where the semiconductor particle acts as photo catalyst or short circuited microelectrodes on excitation. Hence they initiate various redox process of substance adsorbed of the semiconductors as photo catalyst.

Photo catalytic degradation of carboxylic acid derivatives in the presence of semiconductors and saturated carboxylic acid on iron oxide have been studied earlier. [29,30]

The facts mentioned above lead to a curiosity about what results shall be obtained when Copper complexes undergoes photo catalytic degradation and how to affect by factors like pH, semiconductors, light etc. on degradation process.

All the properties led us to undertake the investigation pertaining to thermal behaviour and fungicidal activities of copper soaps and their corresponding complex derived from edible oils for their possible uses and application in agriculture and industries.

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ENCLOSURE -4

MAJOR HYPOTHESIS IF ANY

Photo catalytic degradation is a process for degradation of organic pollutant where the semi conductor particles act as photo catalyst.

Copper soap prepared from various edible oils has been analyzed for their micellar characteristic in non aqueous media with different polarities .

Copper complexes have many dimensions in different fields like wetting, herbicidal, foaming, paints, emulsification, lubricants etc [39,40, 10]

Therefore study of photo degradation and TGA will play an important role in future and found to be a very efficient process in mineralization of organic pollutant where semiconductor acts as Photo catalyst.

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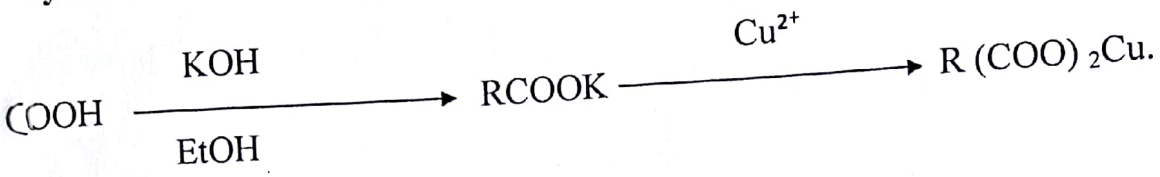
ENCLOSURE -5

RESEARCH METHODOLOGY

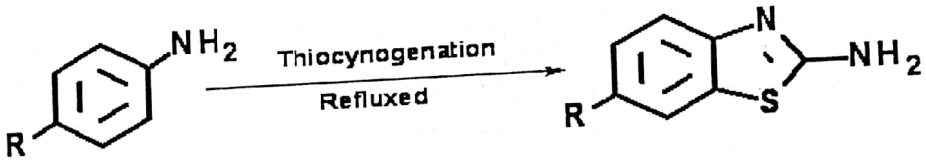
THESIS:

Synthesis of Metal Soaps [41, 42, 23]



Copper surfactants will be synthesized from corresponding oils. Firstly p will be prepared by direct of the corresponding potassium soap with slight excess of uired amount of copper sulphate at 50-55° C. After washing with hot water and alcohol the nple will be dried at 80-100° C and will be recrystalized with hot Benzene.

) Synthesis of Substituted Benzothiazole [43]



The required subtitled Benzothiazole will be synthesized by 'THIOCYANOGENATION" of aniline in the presence of thiocyanogen gas, which is generated in situ by the reaction of Cupric Chloride and Ammonium Thio-Cynate . Mixture will be refluxed for one and half hour. After cooling, Sodium Carbonate will be mixed to neutralize the mixture and to get the substituted Benzothiazole .

(C) Synthesis of complexes

The complexes will be prepared by mixing the metal surfactant and ligand in the molar ratio 1:1, dissolved in ethanol and benzene and mixture will be refluxed for about 1-1 hours, purity of compounds will be checked using T.L.C.

(D)Spectroscopic studies- NMR and ESR specials studies will be made in relation to structural elucidation with the help of CDRI Lucknow and IIT Powai Mumbai.

(E) Photocatalytic Degradation- ZnO and other semiconductors may be used as Photocatalyst soaps, oils and their complexes with different Ligands . Reaction will be studied spectrophotometrically . The effect of different parameters on the rate of photo catalytic degradation will be observed.

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(F)Thermal Degradation- Thermo-analytical methods such as differential scanning colorimetric (DSC) and thermogravimetry / Derivative (TGA/DTA) receiving considerable attention TGA/DTA curve can be used to determine the kinetic parameters and the oxidative induction period.[44-45]

(G) Biological studies may be done.

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ENCLOSURE-6

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